

# Nanotechnology and Cancer Research: Technical and Clinical Perspectives

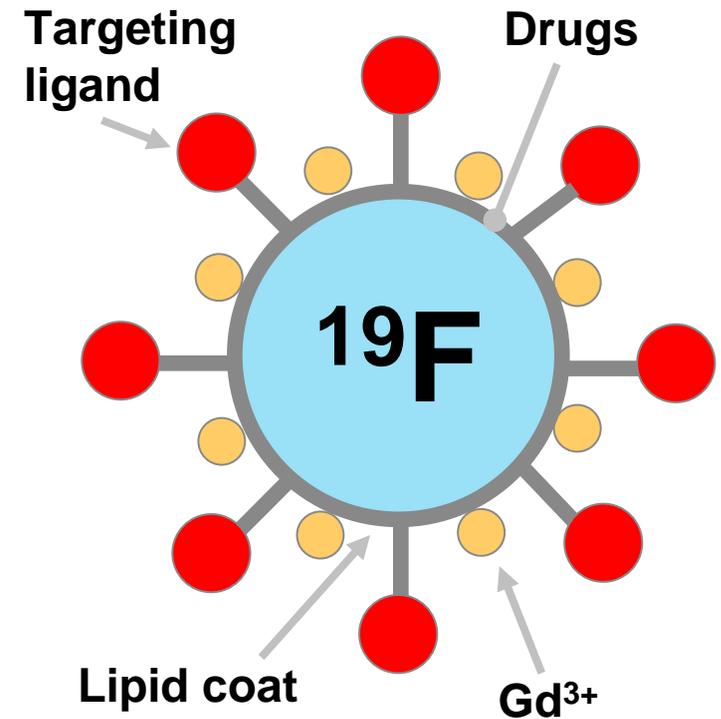
**Scientific Roundtable | September 13, 2004**

**Samuel Wickline, M.D.**

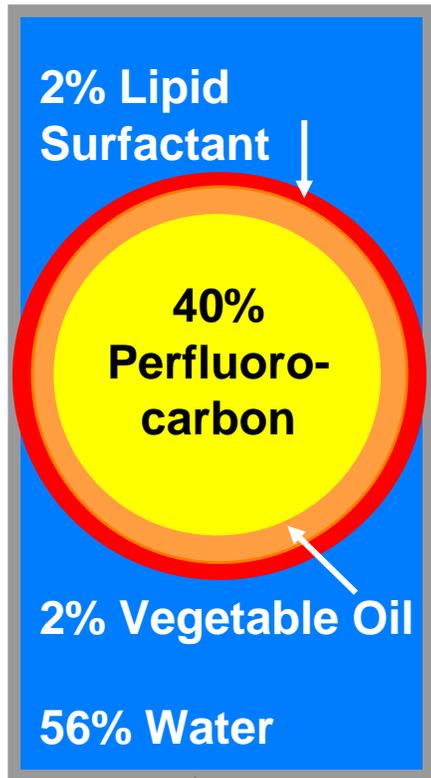
**Professor of Medicine, Physics and Biomedical  
Engineering, Washington University**

# Molecularly Targeted Nanoparticulates For Imaging and Drug Delivery

- Molecular imaging
  - Many targets simultaneously
  - Multimodal:  
Ultrasound, MRI, CT, Nuclear
- Site-targeted therapeutics
  - Single or combination therapy
  - Novel mechanisms of drug delivery
  - Augmentable drug delivery with external energy sources



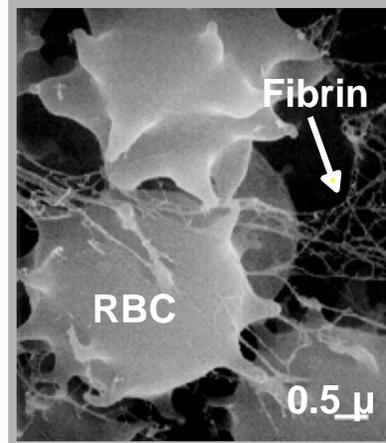
# Nanoscale Targeting Agents: *Liquid Perfluorocarbon Nanoparticle Emulsion*



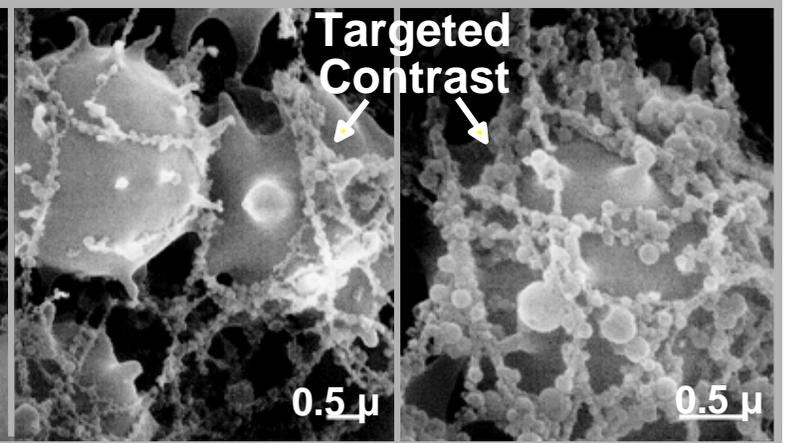
Microemulsification under  
10-20,000 lbs/in<sup>2</sup>



Before



After

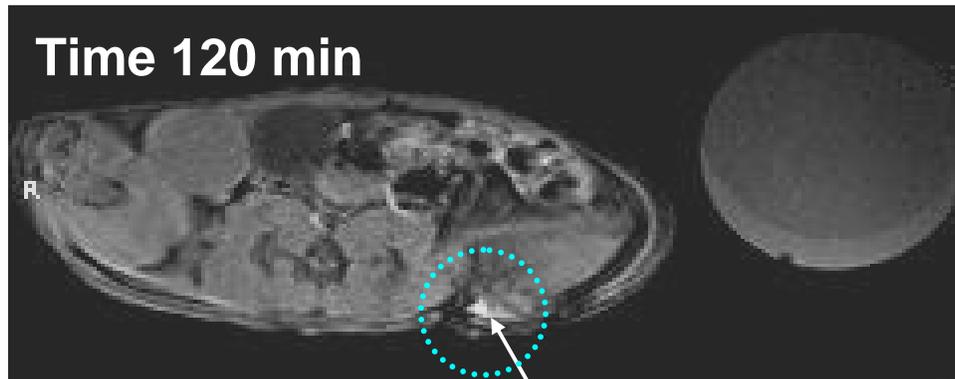
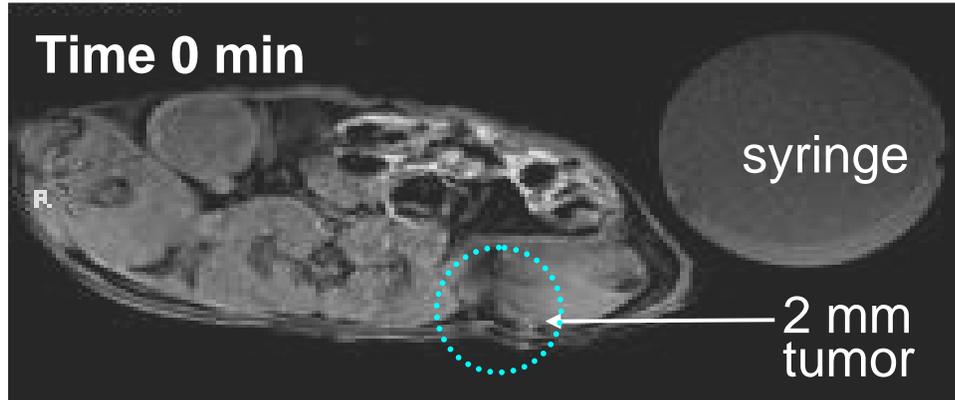


*Fibrin-targeted* particles binding to  
clot *in vitro* (SEM)

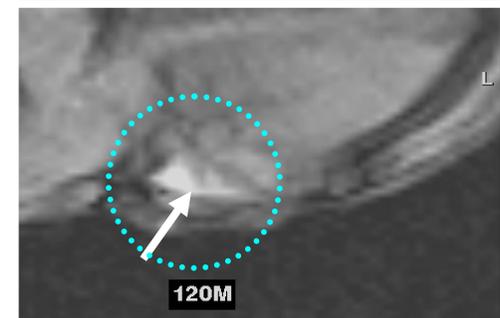
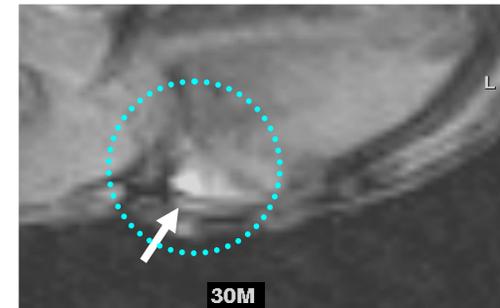
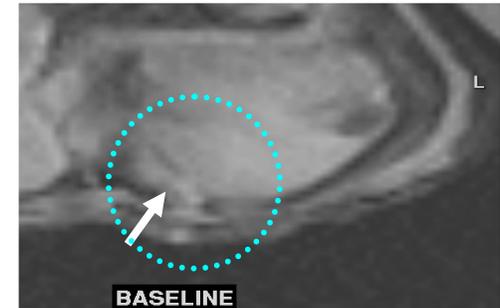
Stable for > 1 year

# Imaging Tumor Angiogenesis with MRI

$\alpha_v\beta_3$  Integrin-Targeted Paramagnetic Nanoparticles (Mouse Imaged @ 1.5T)

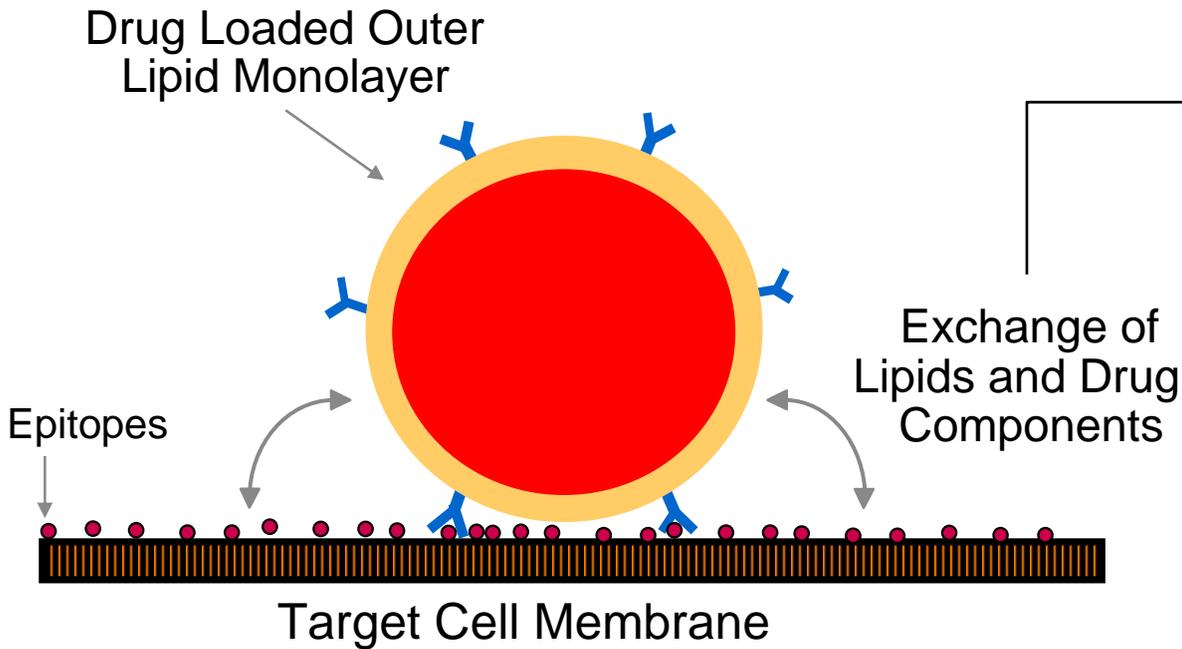


Angiogenesis around  
2 mm melanoma tumor

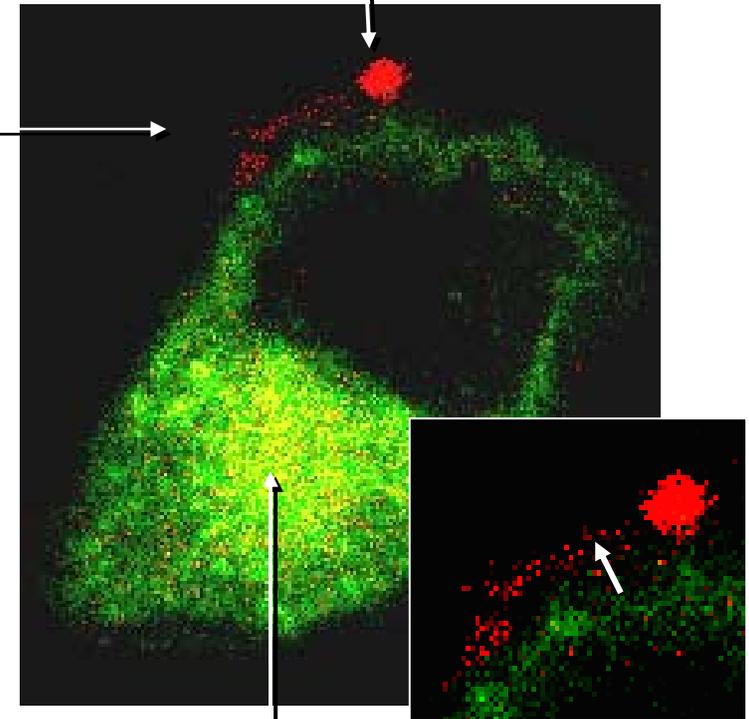


Time course

# Novel Mechanisms Of Drug Delivery: “Contact Facilitated Drug Delivery\*”



rhodamine-labeled NP



GFP-linked endocytotic markers  
rab5 and rab7 in transfected  
C32 melanoma cells

*Circulation* 2002; 106:2842-2847

# The Clinical Promise?

- *Very early diagnosis* of pathology
- *Prediction* of disease course
- *“Rational drug dosing”* for local drug/gene delivery
- *Quantification* of molecular response to therapy
- *Surrogate endpoints* for drug efficacy